

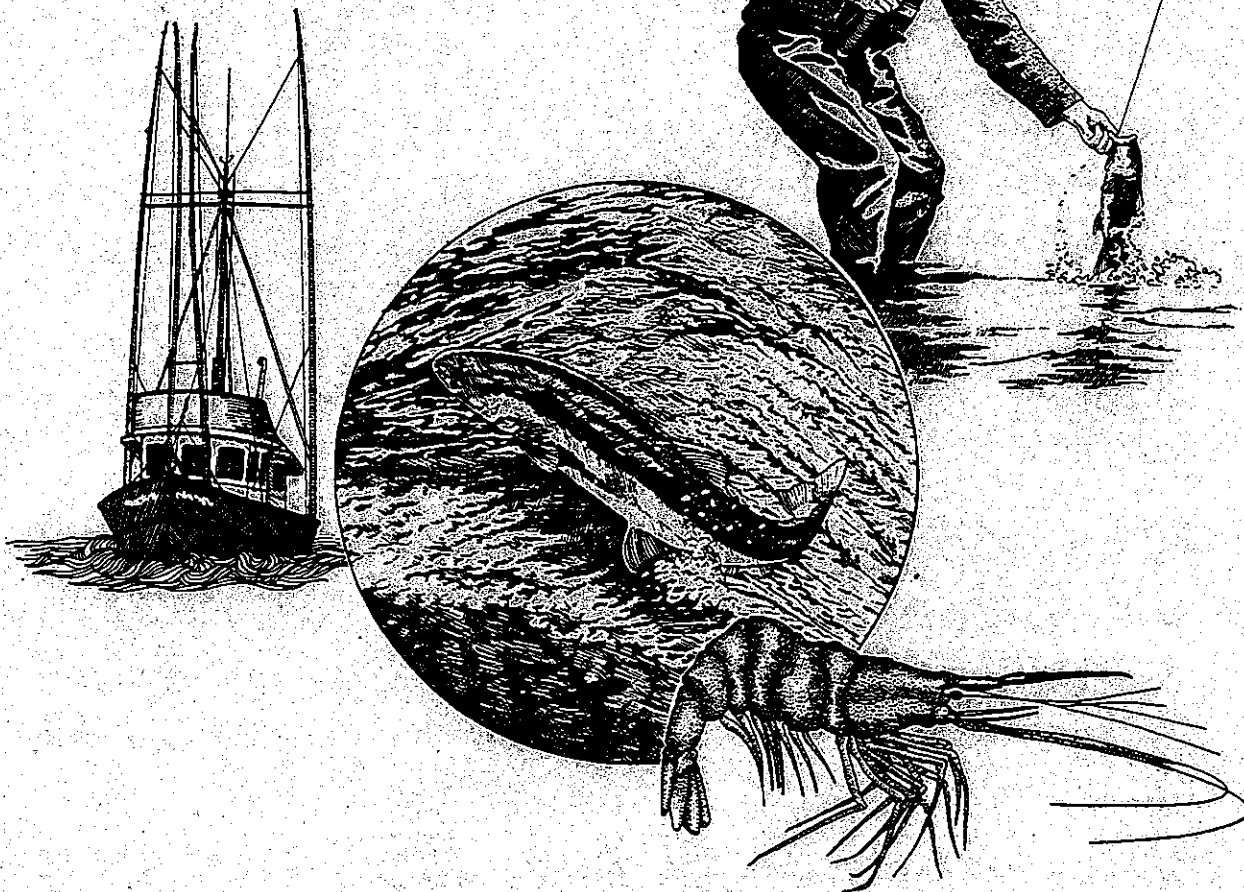
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PROGRESS REPORTS

2000



FISH DIVISION

Oregon Department of Fish and Wildlife

Summer Steelhead Creel Surveys on the Grande Ronde, Wallowa,
and Imnaha Rivers for the 1998-99 Run Year

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ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: Summer Steelhead Creel Surveys on the
Grande Ronde, Wallowa, and Imnaha
Rivers for the 1998-99 Run Year

AGREEMENT NUMBER: 14110-98-J058

PROJECT PERIOD: 1 April 1999 to 31 March 2000

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This project was financed by the U.S. Fish and Wildlife Service under the Lower Snake
River Compensation Plan.

PREFACE

This report is for the funding period 1 April 1999 to 31 March 2000. The sampling period was from 1 September 1998 to 15 April 1999. The report summarizes statistical angler surveys conducted during the summer steelhead angling season in major fishing areas on the Grande Ronde, Wallowa, and Imnaha rivers. Hatchery adults harvested during the 1998-99 run year are primarily from the 1995 and 1996 brood years. Results of creel surveys conducted prior to fall 1998 are reported in previous Lower Snake River Compensation Plan evaluation annual reports (Carmichael et al. 1986, 1987, 1988, 1989, 1990; Flesher et al. 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1999). The steelhead angling season surveyed in this report, during which only adipose-clipped fish could be kept, was open from 1 September 1998 to 15 April 1999 in the Grande Ronde and Imnaha basins.

ACKNOWLEDGMENTS

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SUMMARY

During the 1998-99 steelhead season, angler catch and catch rates were below average for summer steelhead in Grande Ronde and Imnaha basin fisheries, although angler effort and harvest were above average in the Imnaha Basin.

Hatchery summer steelhead dominated the catch in 13 of 19 months surveyed in Grande Ronde and Imnaha basin fisheries.

Anglers harvested more one-ocean than two-ocean hatchery steelhead and more females than males in both the Grande Ronde and Imnaha fisheries.

We sampled adipose fin-clipped and left ventral fin-clipped plus coded-wire-tagged (AdLV+CWT) summer steelhead in both the Grande Ronde and Imnaha basin fisheries, except for Catherine Creek and the upper Grande Ronde River. Expanded estimates for entire fisheries can not be determined until statewide annual harvest card (tag) summaries become available.

The percent of anglers from Oregon counties other than Union or Wallowa (local anglers) was higher than average and accordingly, the percent of local anglers was lower than average in summer steelhead fisheries during the 1998-99 run year in Grande Ronde and Imnaha basin fisheries.

INTRODUCTION

Summer steelhead (*Oncorhynchus mykiss*) fisheries in the Grande Ronde and Imnaha basins were closed in 1974. This closure was prompted by declining adult returns, as indicated by adult counts at Ice Harbor Dam on the Snake River (U.S. Army Corps of Engineers 1996) and low steelhead redd counts on index streams in the Grande Ronde and Imnaha basins (Oregon Department of Fish and Wildlife District Annual Reports 1949-1974). The Lower Snake River Compensation Plan (LSRCP), initiated by Congress in 1976, was developed to compensate for losses of anadromous salmonids in the Snake River basin from construction of the four lower Snake River Dams built between 1962 and 1976. Thus, the focus of the LSRCP is above Lower Granite Dam (Rkm 173), the uppermost of the four lower dams on the Snake River. One of the primary objectives of the LSRCP in Oregon is to restore historic recreational and tribal fisheries for summer steelhead in the Grande Ronde and Imnaha basins (Carmichael 1989). Approximately 1.68 M steelhead smolts are released in Oregon each year during April and May in the Grande Ronde and Imnaha basins. These fish provide hatchery adult returns which contribute to recreational fisheries and may supplement natural spawning populations in northeast Oregon. Consumptive recreational fisheries for summer steelhead re-opened in 1986, in part as a result of increases in hatchery adult returns.

We began creel surveys for summer steelhead during the fall of 1985 in both the Grande Ronde and Imnaha basins. The goal of these surveys is to provide annual harvest information needed to assess LSRCP compensation goals (Carmichael and Wagner 1983). In general, the number of summer steelhead in the recreational fishery has been restored to historic values, but the fishery is concentrated at different times and places (Flesher et al. 1994). This report summarizes results of creel surveys conducted during the fall of 1998 and the spring of 1999 in the Grande Ronde and Imnaha basins. The Grande Ronde and Imnaha basins encompass the major steelhead fisheries in Oregon that occur in streams which drain into the Snake River upstream of Lower Granite Dam.

STUDY AREA

Creel surveys on the Grande Ronde River were conducted on a lower 24 km section from the Oregon-Washington state line (Rkm 62) upstream to Wildcat Creek (Rkm 86) and an upper 39 km section from the Highway 82 bridge at Island City (Rkm 256) upstream to Meadow Creek (Rkm 295; Figure 1). The survey on Catherine Creek was conducted on a 22 km section from the Highway 203 bridge below the town of Union (Rkm 24) upstream to the Highway 203 bridge above Catherine Creek State Park (Rkm 46). The survey on the Wallowa River was conducted on a 50 km section from Minam State Park (Rkm 13) upstream to the mouth of Trout Creek (Rkm 63) near Enterprise. Anglers who parked their vehicles at Minam State Park to fish just below the park were included in the survey. No surveys were conducted at Rondowa (the confluence of the Wallowa and Grande Ronde rivers) due to limited vehicle access. The survey on the Imnaha River was conducted on the lower 32 km from its confluence with the Snake River (Rkm 0) upstream to the mouth of Big Sheep Creek (Rkm 32) near the town of Imnaha (Figure 1).

METHODS

For the lower Grande Ronde River survey, we used the methodology described by Carmichael et al. (1988). We sampled 50% of the weekends and holidays and 30% of the weekdays during each month of each survey. Initially, sample days were chosen randomly in two-day blocks. They were then adjusted to equally represent days within two time periods (weekend days and holidays, and weekdays). Weekend days and holidays included Saturday, Sunday, and holidays (71 total days) and weekdays included Monday through Friday (except for holidays; 156 total days). Each sample day, beginning at a randomly selected start time, the creel surveyor conducted a pressure count by tallying all anglers and vehicles every three hours while driving a vehicle along the entire survey route. Between pressure counts, the surveyor interviewed anglers by recording a description of each angler and their vehicle, their residence, the number of hours they had fished, and the number and species caught. The surveyor also sampled all harvested fish by recording fork length (mm), sex, fin

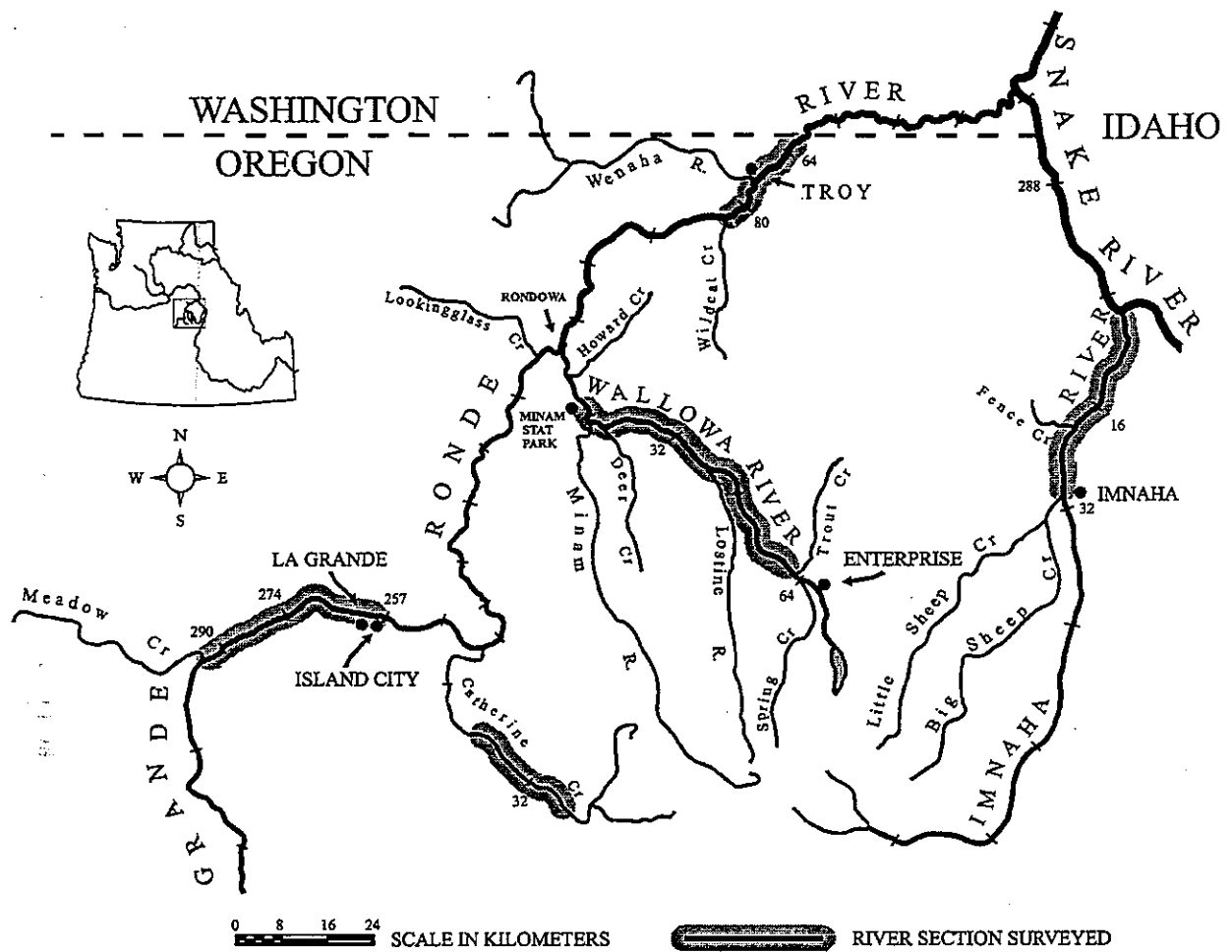


Figure 1. Map of northeastern Oregon showing where summer steelhead creel surveys were conducted in the Grande Ronde and Imnaha basins during the 1998-99 run year.

clip, and any external tags. If the fish was coded-wire-tagged (CWT), as indicated by an adipose fin-clip and left ventral fin-clip (AdLV), the surveyor asked permission from the angler, then excised the snout behind the eye and placed it with an identification number in a plastic bag for later processing. For the Imnaha River survey, we used a check station for the area below Fence Creek (Rkm 23) and a roving survey in the area above Fence Creek. In earlier years, a check station located near the town of Imnaha was used for the entire survey. The check station was designed so that anglers leaving the lower river area during a sample day would stop voluntarily and the surveyor would interview each angler and sample all harvested fish. At the end of the second sample day, the surveyor would drive to Cow Creek (Rkm 7) and interview all anglers for that day and the previous sample day. For the roving survey we followed the same procedures as on the lower Grande Ronde River survey except that the surveyor interviewed anglers during pressure counts. For each pressure count the surveyor closed the check station, interviewed all anglers from Fence Creek to the town of Imnaha, then returned. Time spent away from the check station was recorded and later expanded.

For the upper Grande Ronde River, Catherine Creek, and Wallowa River survey areas, one surveyor conducted angler interviews from 1 February to 15 April 1999. We randomly selected survey areas. A minimum of two areas were surveyed each sample day. Each sample day, the surveyor drove the survey route, stopped to interview anglers, then drove to the next area and repeated this sequence. If sufficient time was available, the surveyor included and interviewed anglers in a third area. All harvested fish observed were sampled. We sampled 100% of the weekends and from 40-60% of the weekdays. From 1 February to 28 February, we surveyed five days each week from 0800-1700. From 1 March to 15 April, we surveyed four days each week from 0700-1800.

From the lower Grande Ronde and Imnaha river creel surveys, we estimated angler effort in hours and days, total catch, harvest, catch rate, percent hatchery fish in the catch, and the number of AdLV+CWT marked fish harvested (see Carmichael et al. 1988). In all other areas, we estimated catch rate and percent hatchery fish in the catch. In addition, we determined age and sex composition and mean fork length of harvested fish in all survey areas. Catch rate was expressed as an index, hours per fish, which resulted in lower catch rates reflecting better angling success. The survey on the lower Grande Ronde River was from 1 September 1998 to 15 April 1999. Surveys on the upper Grande Ronde, Wallowa, and Imnaha rivers, and Catherine Creek were from 1 February to 15 April 1999.

ACCOMPLISHMENTS AND FINDINGS

On the lower Grande Ronde River, we sampled an average of 57.8% of the weekends and holidays and 31.6% of the weekdays each month for a total of 90 sample days. On the upper Grande Ronde River, we sampled an average of 76.0% of

the weekends and holidays and 50.7% of the weekdays each month for a total of 41 sample days. On Catherine Creek, we sampled an average of 64.0% of the weekends and holidays and 44.3% of the weekdays each month for a total of 37 sample days. On the Wallowa River, we sampled an average of 80.3% of the weekends and holidays and 50.7% of the weekdays each month for a total of 42 sample days. On the Imnaha River, we sampled an average of 55.6% of the weekends and holidays and 34.3% of the weekdays each month for a total of 30 sample days.

We estimated that 1,864 anglers fished for 9,541 hours on the lower Grande Ronde River. They caught and released 213 wild and 119 hatchery steelhead and kept 244 hatchery steelhead for a catch rate index of 17 hours per fish (Figures 2-6, Appendix A-1). The percent of steelhead caught that were hatchery fish ranged from 0% in September 1998 to 82% in February 1999 (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead was 674 (± 22) mm for males and 671 (± 18) mm for females (Table 1). Age composition of harvested hatchery steelhead was 70% 1:1's (one year spent in freshwater : one year spent in saltwater) and 30% 1:2's (one year spent in freshwater: two years spent in saltwater). Sex composition was 35% male and 65% female (Table 1). Seventy-four percent of the anglers were from Union or Wallowa counties, 19% were from other Oregon counties, 4% were Washington State residents and 3% resided outside the states of Oregon and Washington (Table 2). On the lower Grande Ronde River, anglers harvested an estimated 19 AdLV+CWT marked steelhead from our hatchery releases (Table 3).

On the upper Grande Ronde River, the catch rate index averaged 19 hours per fish (Figure 4, Appendix A-2). The percent of steelhead caught that were hatchery fish ranged from 29% in March to 47% in April (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead was 763 mm for a male and 640 mm for a female (Table 1). Age composition of harvested hatchery steelhead was 50% 1:1's and 50% 1:2's. Sex composition was 50% male and 50% female (Table 1). Ninety-six percent of the anglers were from Union or Wallowa counties and 4% were from other Oregon counties (Table 2). Anglers did not harvest any AdLV+CWT marked steelhead on the upper Grande Ronde River from our hatchery releases (Table 3).

On Catherine Creek, the catch rate index averaged 14 hours per fish (Figure 4, Appendix A-3). One harvested fish was sampled. It was a 651 mm, age 1:2 male (Figure 7, Table 1, Appendix B). Ninety-one percent of the anglers were from Union or Wallowa counties and 9% were from other Oregon counties (Table 2). Anglers did not harvest any AdLV+CWT marked steelhead on Catherine Creek from our hatchery releases (Table 3).

On the Wallowa River, the catch rate index averaged 18 hours per fish (Figure 4, Appendix A-4). The percent of steelhead caught that were hatchery fish ranged from 75% in April to 87% in March (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead was 656 (± 28) mm for males and

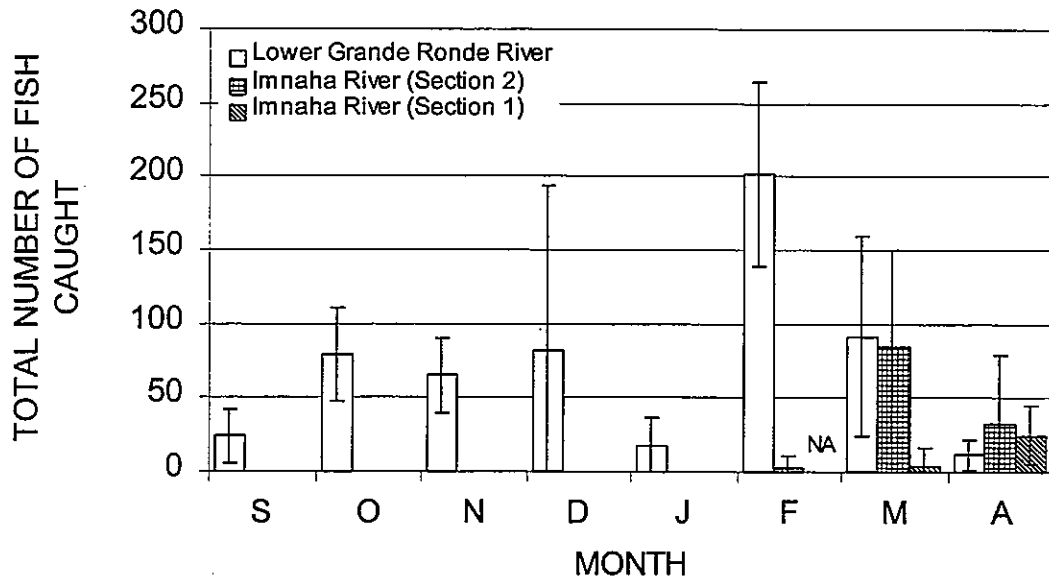


Figure 2. Estimated total catch of summer steelhead ($\pm 95\%$ C.I.'s) on the lower Grande Ronde River and two sections of the Imnaha River during the 1998-99 run year. NA indicates no anglers. Surveys were conducted from 1 September 1998 to 15 April 1999 on the lower Grande Ronde River and from 1 February to 15 April 1999 on the Imnaha River.

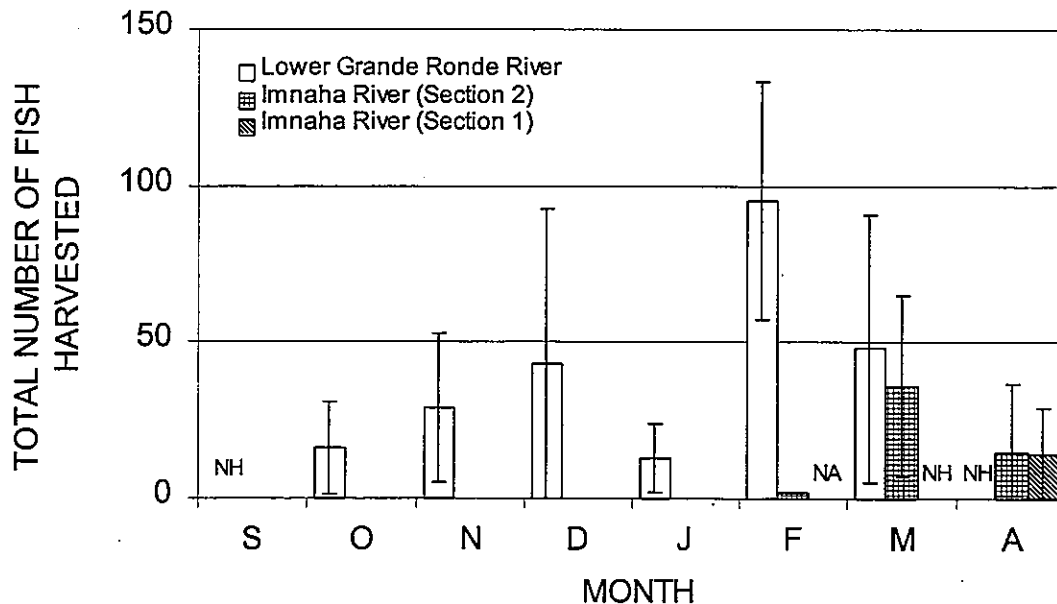


Figure 3. Estimated total harvest of summer steelhead ($\pm 95\%$ C.I.'s) on the lower Grande Ronde River and two sections of the Imnaha River during the 1998-99 run year. NH indicates no harvest and NA indicates no anglers. Surveys were conducted from 1 September 1998 to 15 April 1999 on the lower Grande Ronde River and from 1 February to 15 April 1999 on the Imnaha River.

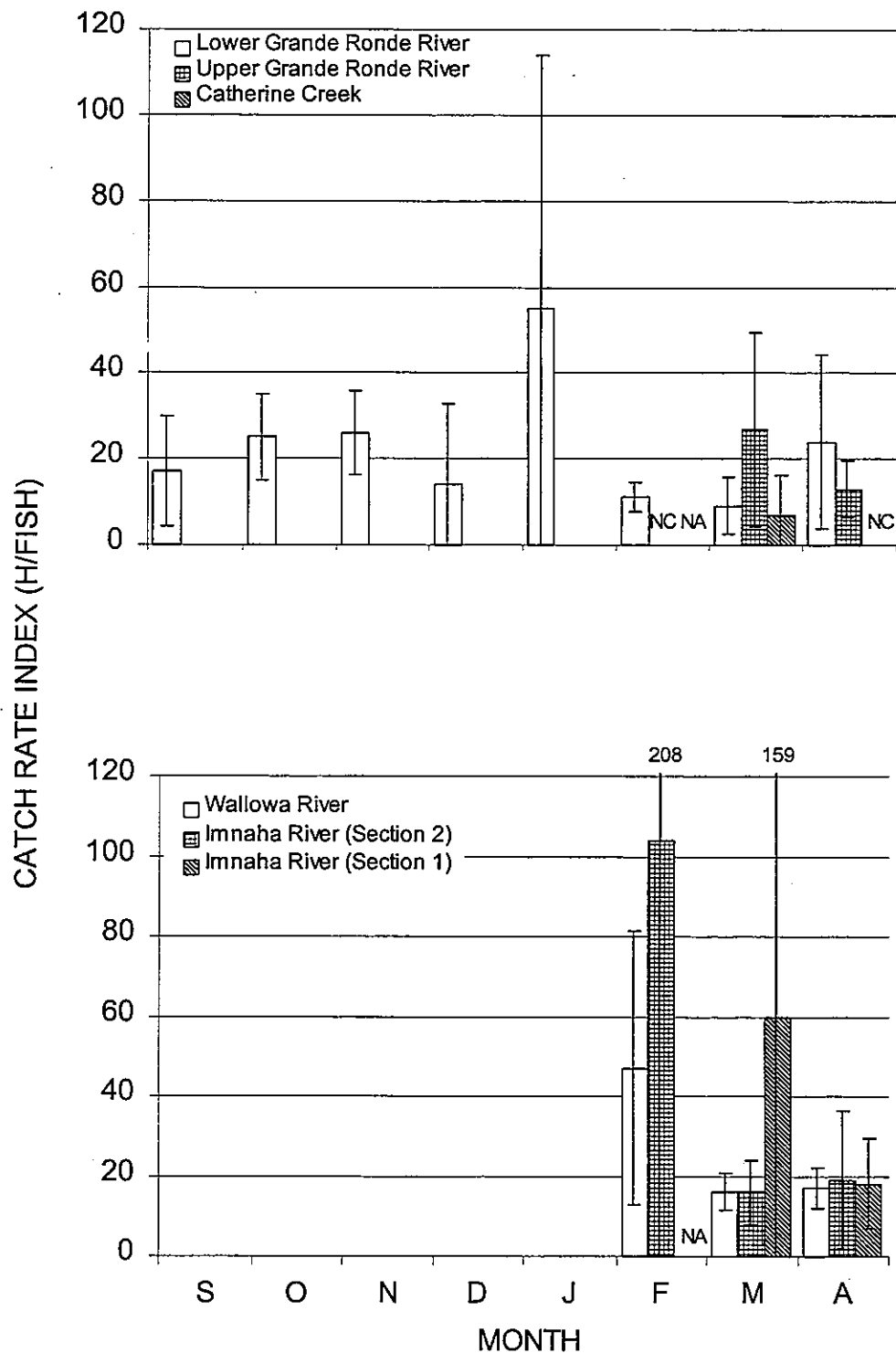


Figure 4: Estimated catch rate index (h/fish) for summer steelhead ($\pm 95\%$ C.I.'s) in the Grande Ronde and Imnaha basins during the 1998-99 run year. NC indicates no catch and NA indicates no anglers. Survey areas and times include the lower Grande Ronde River (1 September-to 15 April), upper Grande Ronde River, Catherine Creek, Wallowa River, and two sections of the Imnaha River (1 February-15 April). Note: A lower catch rate index implies better angling success.

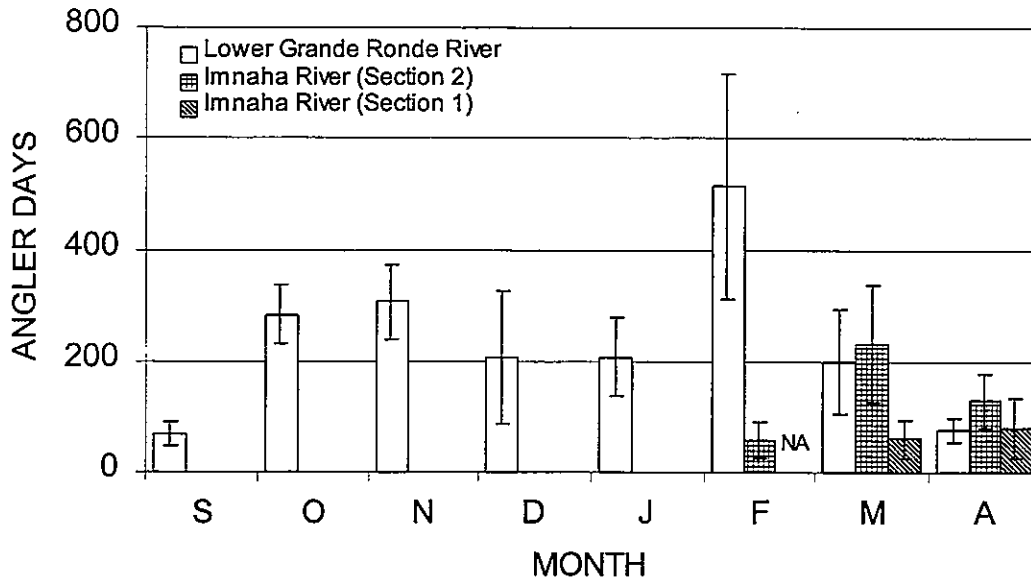


Figure 5. Estimated number of angler days for summer steelhead ($\pm 95\%$ C.I.'s) on the lower Grande Ronde River and two sections of the Imnaha River during the 1998-99 run year. NA indicates no anglers. Surveys were conducted from 1 September 1998 to 15 April 1999 on the lower Grande Ronde River and from 1 February to 15 April 1999 on the Imnaha River.

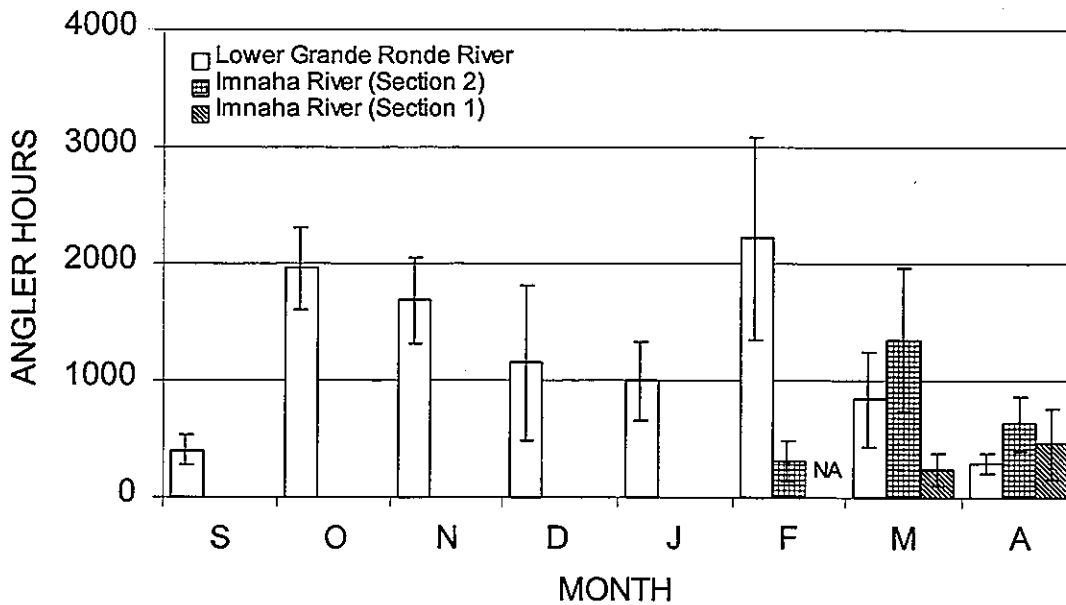


Figure 6. Estimated number of angler hours for summer steelhead ($\pm 95\%$ C.I.'s) on the lower Grande Ronde River and two sections of the Imnaha River during the 1998-99 run year. NA indicates no anglers. Surveys were conducted from 1 September 1998 to 15 April 1999 on the lower Grande Ronde River and from 1 February to 15 April 1999 on the Imnaha River.

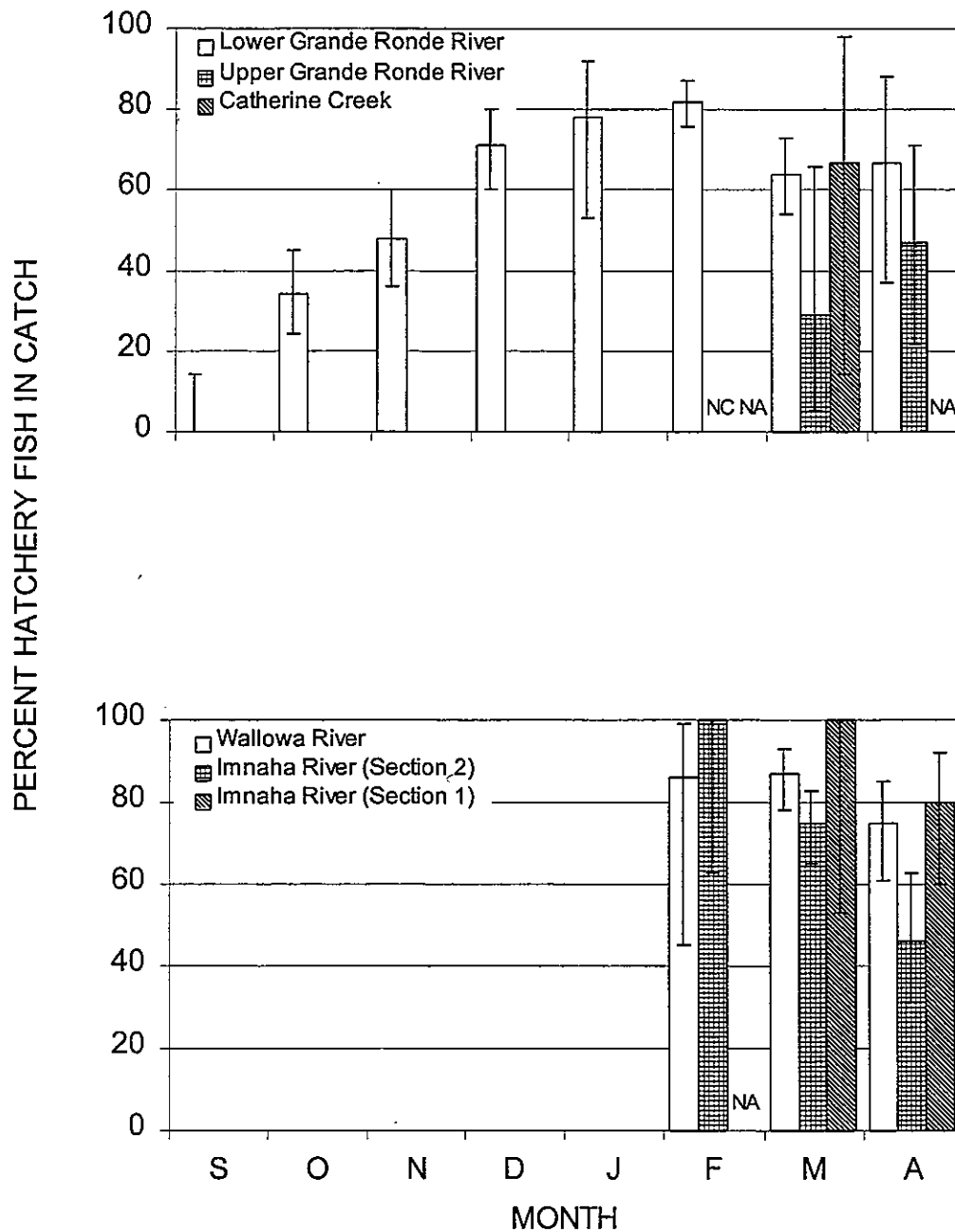


Figure 7. Estimated percent of summer steelhead caught ($\pm 95\%$ C.I.'s; using a binomial distribution) in the Grande Ronde and Imnaha basins during the 1998-99 run year that were hatchery fish. NC indicates no catch and NA indicates no anglers. Survey areas and times include the lower Grande Ronde River (1 September-to 15 April), upper Grande Ronde River, Catherine Creek, Wallowa River, and two sections of the Imnaha River (1 February-15 April).

Table 1. Percent age composition and mean fork length of hatchery summer steelhead sampled in creel surveys in the Grande Ronde and Imnaha basins during the 1998-99 run year. Age composition estimated using the percent by age and sex of coded-wire tagged hatchery returns to Wallowa Hatchery and Little Sheep Creek Facility (Imnaha River) in 1999. Age is expressed as years spent in freshwater prior to ocean migration; years spent in the ocean prior to spawning migration. Mean fork length includes $\pm 95\%$ confidence interval.

Creel survey area, sex	N	Age composition (%)			Mean fork length (mm)
		1:1	1:2	1:3	
Lower GR River					
Males	28	90	10	0	674 \pm 22
Females	52	53	47	0	671 \pm 18
Total	80	70	30	0	672 \pm 14
Upper GR River					
Males	1	0	100	0	763
Females	1	100	0	0	640
Total	2	50	50	0	702
Catherine Creek					
Males	1	0	100	0	651
Wallowa River					
Males	33	90	10	0	656 \pm 28
Females	36	53	47	0	675 \pm 20
Total	69	70	30	0	666 \pm 16
Imnaha River					
Males	7	89	11	0	683 \pm 56
Females	15	58	39	3	625 \pm 33
Total	22	75	24	1	643 \pm 29

Table 2. Residence of summer steelhead anglers interviewed during creel surveys in the Grande Ronde and Imnaha basins during the 1998-99 run year.

Creel survey area	Number of anglers	Percent			
		Union or Wallowa counties	Other Oregon counties	Washington	Other states
Lower GR River	814	74	19	4	3
Upper GR River	197	96	4	0	0
Catherine Creek	34	91	9	0	0
Wallowa River	783	58	38	1	3
Imnaha River	213	90	1	3	6

Table 3. Number of AdLV+CWT marked summer steelhead recovered during creel surveys in the Grande Ronde and Imnaha basins during the 1998-99 run year. No AdLV+CWT marked fish were recovered in the upper Grande Ronde River or Catherine Creek. Recoveries were expanded for the entire fishery.

Run year, creel survey area	Tag code	Release site	Experimental group ^a	Brood year	Number recovered	
					Observed	Expanded ^b
1998-99						
Lower Grande Ronde River	07 11 59	Deer Cr.	Acclimated	95	1	5
	07 11 60	Deer Cr.	Acclimated	95	1	2
	07 11 61	Deer Cr.	Direct Stream	95	1	3
	09 18 25	Deer Cr.	Forced/S-F	96	1	2
	09 18 26	Deer Cr.	Volitional/S-F	96	1	5
	09 18 28	Spring Cr.	Volitional	96	1	2
Wallowa River	07 11 59	Deer Cr.	Acclimated	95	1	ND
	07 11 62	Deer Cr.	Direct Stream	95	1	ND
	07 53 30	Deer Cr.	Forced/F-S	96	1	ND
	09 18 26	Deer Cr.	Volitional/S-F	96	1	ND
	09 18 27	Deer Cr.	Volitional/F-S	96	4	ND
Imnaha River	07 12 18	L. Sheep Cr.	Acclimated	95	3	8
	07 12 19	L. Sheep Cr.	Direct Stream	95	1	3
	09 18 32	L. Sheep Cr.	S-F	96	1	3
	09 18 33	L. Sheep Cr.	F-S	96	3	7

^a S-F indicates slow growth followed by fast growth and F-S indicates fast growth followed by slow growth during rearing at Irrigon Hatchery prior to release.

^b ND indicates expansions not determined until statewide annual harvest card data become available.

675 (± 20) mm for females (Table 1). Age composition of harvested hatchery steelhead was 70% 1:1's and 30% 1:2's. Sex composition was 48% male and 52% female (Table 1). Fifty-eight percent of the anglers were from Union or Wallowa counties, 38% were from other Oregon counties, 1% were Washington State residents and 3% resided outside the states of Oregon and Washington (Table 2). On the Wallowa River, anglers harvested 8 AdLV+CWT marked steelhead from our hatchery releases, however, expanded estimates for the entire fishery will not be determined until state harvest punch card data become available (Table 3).

On the Imnaha River, we estimated that 560 anglers fished for 2,995 hours. They caught and released 44 wild and 39 hatchery steelhead and kept 67 hatchery steelhead for a catch rate index of 20 hours per fish (Figures 2-6, Appendices A-5 and A-6). The percent of steelhead caught that were hatchery fish ranged from 46% in April in Section 2 to 100% in February and March in Section 1 (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead was 683 (± 56) mm for males and 625 (± 33) mm for females (Table 1). Age composition of harvested hatchery steelhead was 75% 1:1's, 24% 1:2's and 1% 1:3's. Sex composition was 32% male and 68% female (Table 1). Ninety percent of the anglers were from Union or Wallowa counties, 1% were from other Oregon counties, 3% were Washington State

residents and 6% resided outside the states of Oregon and Washington (Table 2). On the Imnaha River, anglers harvested an estimated 21 AdLV+CWT marked steelhead from our hatchery releases (Table 3).

Angler effort (Figure 8) was 90% and harvest (Figure 9) was 62% of the 13 year average for the 1998-99 run year on the lower Grande Ronde River. However, on the Imnaha River angler effort was 127% and harvest was 116% of the 11 year average (1985-86 to 1995-96 run years) for the 1998-99 run year.

The percent of non-local anglers from Oregon counties other than Union and Wallowa was greater (135% of the 13 year average) whereas the percent of local anglers (from Union or Wallowa counties) was lower (93% of the 13 year average) in summer steelhead fisheries in the Grande Ronde and Imnaha basins (Figure 10).

Catch rates were relatively poor (96% and 66% of the 13 year average) in the Grande Ronde and Imnaha river basins, respectively (Table 4).

MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

Steelhead fisheries in the Grande Ronde and Imnaha river basins are largely dependent on hatchery programs. Similar to previous years, hatchery fish contributed to the catch during each month in each fishery except on the lower Grande Ronde River in September. Hatchery fish dominated the catch in 13 of 19 months sampled. In addition, although the fishery was below average in terms of total catch and catch rates, both angler effort and harvest were above average in the Imnaha Basin. Low catch and poor catch rates were due in part to lower than average run sizes for both basins (LSRCP Oregon Evaluation Studies, unpublished data). This illustrates the contribution and importance of hatchery steelhead in recreational summer steelhead fisheries in the Grande Ronde and Imnaha basins.

It has been suggested that the previous location of the check station on the Imnaha River resulted in an underestimate of angler effort. Therefore, to obtain more complete fishery catch statistics the check station location was moved and a roving survey was added to this survey. The check station was relocated to an area just above the most remote section of the river and a roving survey was initiated along the more residential section of the river. The increase in angler effort we observed this year may have been the result of this change in methods. Although difficult to evaluate because of year to year variation, angler effort this year was higher than the most current three-year average (1993-94 to 1995-96 run years), whereas, angler effort this year was similar to the same three-year average in the lower Grande Ronde River fishery. This different pattern likely suggests that the change in our method gave us a more complete assessment of the Imnaha River fishery. Thus, in the past we were concerned that the Imnaha River fishery was underexploited, when in part, our low numbers may have resulted from our sampling technique.

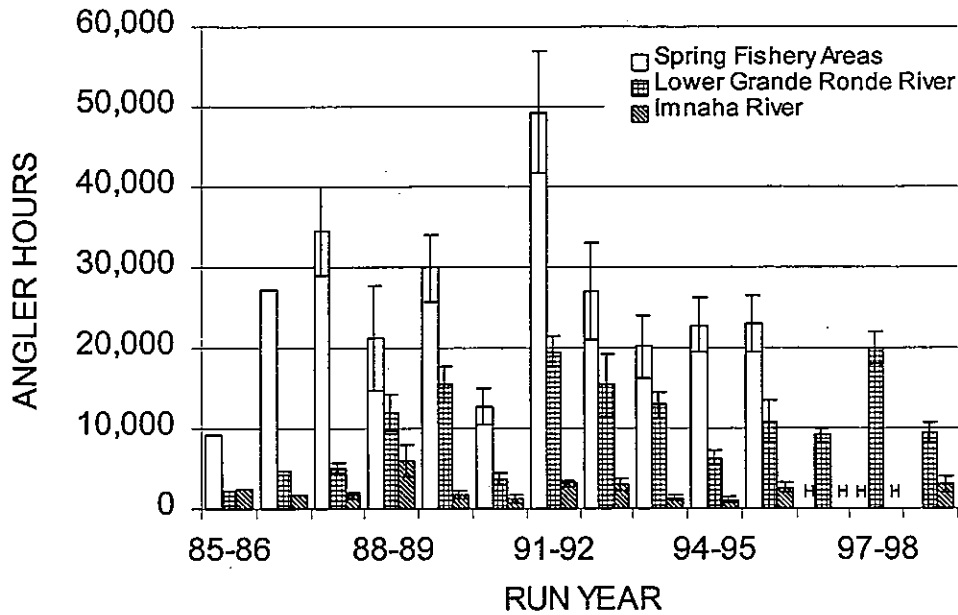


Figure 8. Angler effort for summer steelhead (\pm 95% C.I.'s) in spring fishery areas (upper Grande Ronde River, Wallowa River, Rondowa, and Catherine Creek), the lower Grande Ronde River, and the Imnaha River for the 1985-86 to 1998-99 run years. H indicates this value must be estimated from harvest card data, which was not available when this report was submitted. Confidence intervals not available for the 85-86 and 86-87 run years.

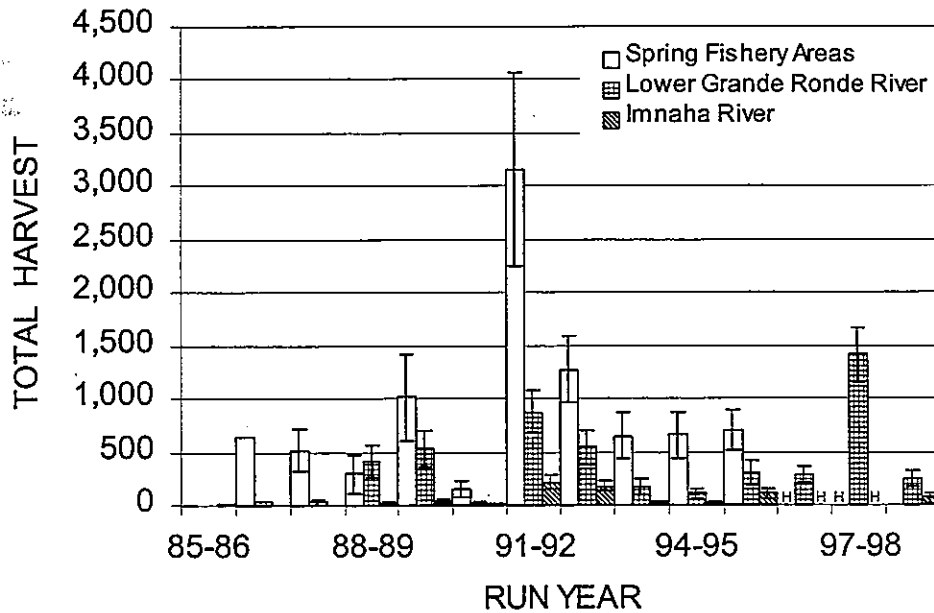


Figure 9. Number of hatchery summer steelhead harvested (\pm 95% C.I.'s) by recreational anglers in spring fishery areas (upper Grande Ronde River, Wallowa River, Rondowa, and Catherine Creek), the lower Grande Ronde River, and the Imnaha River for the 1985-86 to 1998-99 run years. H indicates this value must be estimated from harvest card data, which was not available when this report was submitted. Confidence intervals not available for the 85-86 and 86-87 run years.

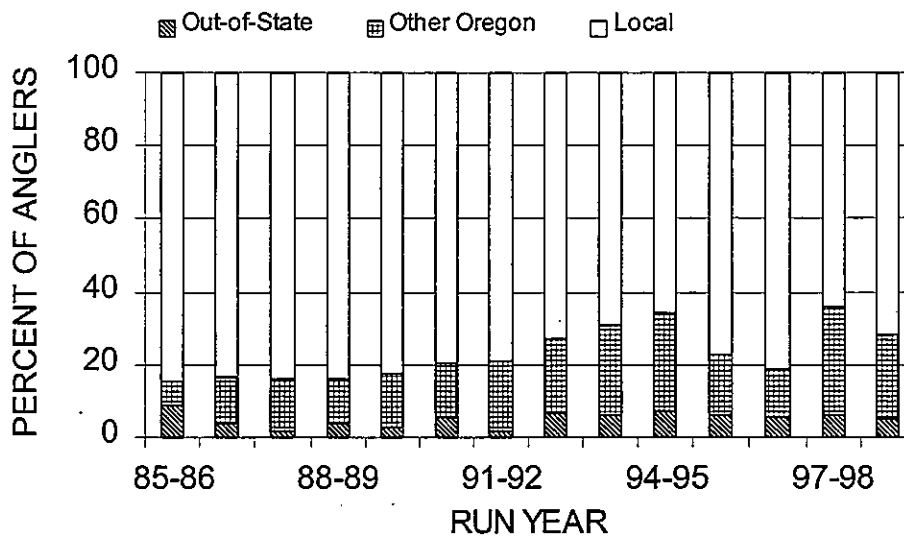


Figure 10. Percent of local (Union or Wallowa county), other Oregon county, and out-of-state anglers that fished in summer steelhead fisheries in the Grande Ronde and Imnaha basins for the 1985-86 to 1998-99 run years.

Table 4. Catch rate index (h/fish \pm 95% C.I.) in summer steelhead fisheries in creel survey areas in the Grande Ronde and Imnaha basins for the 1985-86 to 1998-99 run years. Note: a lower catch rate index implies better angling success.

Run year	Catch rate index (hours/fish)					
	Lower GR River	Upper GR River	Catherine Creek	Rondowa	Wallowa River	Imnaha River
85-86	8 \pm 7				7 \pm 7	15 \pm 7
86-87	9 \pm 3				11 \pm 3	9 \pm 8
87-88	10 \pm 4			11 \pm 9	16 \pm 3	24 \pm 9
88-89	14 \pm 4	40 \pm 55			43 \pm 21	18 \pm 11
89-90	14 \pm 4	14 \pm 8		34 \pm 27	17 \pm 5	20 \pm 8
90-91	19 \pm 8	24 \pm 11			6 \pm 2	13 \pm 6
91-92	11 \pm 3	10 \pm 3	3 \pm 3	6 \pm 1	10 \pm 2	4 \pm 1
92-93	9 \pm 2	14 \pm 4	49 \pm 49		11 \pm 2	8 \pm 1
93-94	18 \pm 5	31 \pm 17		12 \pm 4	17 \pm 3	13 \pm 3
94-95	21 \pm 6	25 \pm 13		15 \pm 5	17 \pm 3	17 \pm 8
95-96	11 \pm 2	15 \pm 4			21 \pm 4	7 \pm 2
96-97	14 \pm 4	18 \pm 9	33 \pm 69		13 \pm 3	6 \pm 2
97-98	7 \pm 1	13 \pm 9	7 \pm 10	11 \pm 6	10 \pm 1	18 \pm 9
98-99	17 \pm 4	19 \pm 9	14 \pm 20		18 \pm 4	20 \pm 8

We continued our reduced sampling effort during spring fisheries on the Wallowa and upper Grande Ronde rivers and Catherine Creek. This reduced sampling limits our fishery information primarily to estimates of catch rate and samples from harvested fish. Complete fishery statistics for these fisheries are dependent on statewide annual harvest cards (tags), thus managers will have to wait until tag summaries become available. Finally, because of consistently low angler effort in recent years, (fewer than two anglers interviewed per day), we recommend that the angler survey on Catherine Creek be discontinued (see Appendix A-3).

REFERENCES

- Carmichael, R.W. 1989. Lower Snake River Compensation Plan--Oregon Evaluation Studies, Five-Year Study Plan. Oregon Department of Fish and Wildlife, Fish Research Project, Portland.
- Carmichael, R.W., M.W. Flesher, and R.T. Messmer. 1989. Summer steelhead creel surveys in the Grande Ronde, Wallowa, and Imnaha Rivers for the 1988-89 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.
- Carmichael, R.W., M.W. Flesher, and R.T. Messmer. 1990. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1989-90 run year. Oregon Department of Fish and Wildlife, Fish Research Project AFF1-91-12, Annual Progress Report, Portland.
- Carmichael, R.W., R.T. Messmer, and B.A. Miller. 1987. Lower Snake River Compensation Plan--Oregon Evaluation Studies. Oregon Department of Fish and Wildlife, Fish Research Project FRI/LSR-88-16, Annual Progress Report, Portland.
- Carmichael, R.W., B.A. Miller, and R.T. Messmer. 1986. Lower Snake River Compensation Plan--Oregon Evaluation Studies. Oregon Department of Fish and Wildlife, Fish Research Project FRI/LSR-86-35, Annual Progress Report, Portland.
- Carmichael, R.W., B.A. Miller, and R.T. Messmer. 1988. Summer steelhead creel surveys in the Grande Ronde, Wallowa, and Imnaha Rivers for the 1987-88 run year. Oregon Department of Fish and Wildlife, Fish Research Project AFF1-LSR-89-02, Annual Progress Report, Portland.
- Carmichael, R.W., and E.J. Wagner. 1983. Evaluation of Lower Snake River Compensation Plan Facilities in Oregon. Oregon Department of Fish and Wildlife, Fish Research Project 14-16-0001-83269, Annual Progress Report, Portland.
- Flesher, M.W., R.W. Carmichael, and R.T. Messmer. 1991. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1990-91 run year. Oregon Department of Fish and Wildlife, Fish Research Project AFF1-92-09, Annual Progress Report, Portland.
- Flesher, M.W., M.A. Buckman, R.W. Carmichael, R.T. Messmer, and T.A. Whitesel. 1992. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1991-92 run year. Oregon Department of Fish and Wildlife, Fish Research Project AFF1-LSR-94-07, Annual Progress Report, Portland.
- Flesher, M.W., M.A. Buckman, R.W. Carmichael, R.T. Messmer, and T.A. Whitesel. 1993. Summer steelhead creel surveys on the Grande Ronde, Wallowa and

Imnaha Rivers for the 1992-93 run year. Oregon Department of Fish and Wildlife, Fish Research Project AFF1-LSR-94-14, Annual Progress Report, Portland.

Flesher, M.W., M.A. Buckman, R.W. Carmichael, R.T. Messmer, and T.A. Whitesel. 1994. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1993-94 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1995. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1994-95 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1996. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1995-96 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1997. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1996-97 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1999. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1997-98 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Oregon Department of Fish and Wildlife. District Annual Reports, LaGrande and Wallowa Districts (1949-1974), Fish Division, Portland.

U.S. Army Corps of Engineers. 1996. Annual Fish Passage Report. Portland and Walla Walla District, Portland.

Appendix A-1. Fishery statistics for summer steelhead on the lower Grande Ronde River during the 1998-99 run year. Statistics include estimates $\pm 95\%$ confidence intervals except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate		Angler days
	Days	Anglers				fish/h	(h/fish)	
September:								
Weekday	7	16	195±127	14±16	0	0.072±0.081(14)		32±21
Weekend	5	31	210±33	10±9	0	0.048±0.042(21)		37±6
Total	12	47	405±132	24±18	0	0.059±0.045(17)		69±22
October:								
Weekday	7	59	1159±321	44±26	8±11	0.038±0.022(26)		144±40
Weekend	6	91	800±151	35±17	8±11	0.044±0.021(23)		140±26
Total	13	150	1959±354	79±31	16±15	0.040±0.016(25)		284±51
November:								
Weekday	5	45	875±309	28±22	12±20	0.032±0.025(31)		164±58
Weekend	6	106	808±195	37±12	17±13	0.046±0.015(22)		143±35
Total	11	151	1683±365	65±25	29±24	0.039±0.015(26)		307±67
December:								
Weekday	7	39	706±649	55±109	24±48	0.078±0.155(13)		126±116
Weekend	6	63	443±136	27±18	19±14	0.061±0.040(16)		81±25
Total	13	102	1149±663	82±111	43±50	0.071±0.096(14)		207±119
January:								
Weekday	6	35	710±323	9±8	9±8	0.013±0.012(79)		141±64
Weekend	6	41	283±77	9±17	4±8	0.032±0.060(31)		67±18
Total	12	76	993±332	18±19	13±11	0.018±0.019(55)		208±70
February:								
Weekday	6	73	1320±815	117±56	55±34	0.089±0.042(11)		303±187
Weekend	6	122	897±297	86±29	40±18	0.096±0.033(10)		212±70
Total	12	195	2217±868	203±63	95±38	0.092±0.028(11)		515±202
March:								
Weekday	7	27	465±284	56±57	37±39	0.120±0.120(8)		114±70
Weekend	4	38	379±288	37±38	11±18	0.098±0.100(10)		85±65
Total	11	65	844±405	93±68	48±43	0.110±0.079(9)		199±95
April:								
Weekday	4	16	232±78	8±8	0	0.035±0.036(29)		54±18
Weekend	2	8	59±19	4±6	0	0.068±0.096(15)		21±7
Total	6	24	291±80	12±10	0	0.041±0.034(24)		75±21
Grand total	90	810	9541±1323	576±152	244±82	0.060±0.016(17)		1864±258

Appendix A-2. Catch rate for summer steelhead on the upper Grande Ronde River during the 1998-99 run year. Only adipose-marked fish were harvested. "--" indicates not sampled or undefined.

Month, day type	Sample size		Catch rate	
	Days	Anglers	fish/h	(h/fish)
February:				
Weekday	11	3	0.000	--
Weekend	7	19	0.000	--
Total	18	22	0.000	--
March:				
Weekday	9	51	0.018	(54)
Weekend	4	37	0.061	(17)
Total	13	88	0.037	(27)
April:				
Weekday	6	41	0.044	(23)
Weekend	4	46	0.100	(10)
Total	10	87	0.080	(13)
Grand total	41	197	0.052	(19)

Appendix A-3. Catch rate for summer steelhead on Catherine Creek during the 1998-99 run year. Only adipose-marked fish were harvested. "--" indicates not sampled or undefined.

Month, day type	Sample size		Catch rate	
	Days	Anglers	fish/h	(h/fish)
February:				
Weekday	11	0	--	--
Weekend	6	0	--	--
Total	17	0	--	--
March:				
Weekday	9	13	0.188	(5)
Weekend	4	5	0.000	--
Total	13	18	0.144	(7)
April:				
Weekday	4	12	0.000	--
Weekend	3	4	0.000	--
Total	7	16	0.000	--
Grand total	37	34	0.072	(14)

Appendix A-4. Catch rate for summer steelhead on the Wallowa River during the 1998-99 run year. Only adipose-marked fish were harvested.

Month, day type	Sample size		Catch rate	
	Days	Anglers	fish/h	(h/fish)
February:				
Weekday	11	53	0.015	(68)
Weekend	7	84	0.026	(39)
Total	18	137	0.021	(47)
March:				
Weekday	9	178	0.070	(14)
Weekend	5	221	0.055	(18)
Total	14	399	0.062	(16)
April:				
Weekday	6	114	0.049	(20)
Weekend	4	133	0.069	(15)
Total	10	247	0.059	(17)
Grand total	42	783	0.055	(18)

Appendix A-5. Fishery statistics for summer steelhead in Section 2 (mouth to Fence Creek) on the Imnaha River during the 1998-99 run year. Statistics include estimates $\pm 95\%$ confidence intervals except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested. "--" indicates not sampled or undefined.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate		Angler days
	Days	Anglers				fish/h	(h/fish)	
February:								
Weekday	6	2	38 \pm 64	0	--	--		7 \pm 12
Weekend	6	33	274 \pm 166	3 \pm 8	2	0.011 \pm 0.012(91)		51 \pm 31
Total	12	35	312 \pm 177	3 \pm 8	2	0.010 \pm 0.010(104)		58 \pm 33
March:								
Weekday	8	43	754 \pm 453	55 \pm 49	22 \pm 21	0.073 \pm 0.048(14)		136 \pm 82
Weekend	4	42	599 \pm 420	30 \pm 43	14 \pm 20	0.050 \pm 0.042(20)		95 \pm 67
Total	12	85	1353 \pm 618	85 \pm 65	36 \pm 29	0.063 \pm 0.032(16)		231 \pm 106
April:								
Weekday	4	22	445 \pm 237	33 \pm 46	15 \pm 22	0.074 \pm 0.066(13)		75 \pm 40
Weekend	2	24	185 \pm 4	0	--	--		55 \pm 1
Total	6	46	630 \pm 237	33 \pm 46	15 \pm 22	0.052 \pm 0.047(19)		130 \pm 49
Grand total	30	166	2295 \pm 685	121 \pm 80	53 \pm 36	0.053 \pm 0.023(19)		419 \pm 125

Appendix A-6. Fishery statistics for summer steelhead in Section 1 (Fence Creek to town of Imnaha) on the Imnaha River during the 1998-99 run year. Statistics include estimates $\pm 95\%$ confidence intervals except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested. "--" indicates not sampled or undefined.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate		Angler days
	Days	Anglers				fish/h	(h/fish)	
February								
Weekday	6	0	0	0	--	--		0
Weekend	6	0	0	0	--	--		0
Total	12	0	0	0	--	--		0
March:								
Weekday	8	15	208±136	4±12	0	0.019±0.032(52)		46±30
Weekend	4	3	33±32	0	--	--		14±14
Total	12	18	241±140	4±12	0	0.017±0.028(60)		60±35
April:								
Weekday	4	21	399±301	17±15	6±6	0.043±0.030(23)		55±41
Weekend	2	8	60±51	8±14	8±14	0.133±0.160(8)		26±22
Total	6	29	459±306	25±20	14±15	0.054±0.034(18)		81±54
Grand total	30	47	700±336	29±24	14±15	0.041±0.024(24)		141±68

Appendix B. Percent of hatchery summer steelhead caught by month in the Grande Ronde and Imnaha basins during the 1998-99 run year. Total catch for the Lower Grande Ronde and Imnaha rivers and sampled catch for the Upper Grande Ronde and Wallowa rivers and Catherine Creek are shown in parentheses. "--" indicates not sampled or undefined.

Creel survey area	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Lower GR River	0(24)	34(79)	48(65)	71(82)	78(18)	82(202)	64(92)	67(12)
Upper GR River	--	--	--	--	--	--	29(7)	47(15)
Catherine Creek	--	--	--	--	--	--	67(3)	--(0)
Wallowa River	--	--	--	--	--	86(7)	87(75)	75(51)
Imnaha River (Section 2)	--	--	--	--	--	100(3)	75(85)	46(33)
Imnaha River (Section 1)	--	--	--	--	--	--	100(4)	80(25)



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